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[Claim(s)]

[Claim 1]A brazing-material sheet which comprises skin material for antioxidizing which consists of an aluminum alloy which has solidus temperature higher than liquidus temperature of a brazing material, and a wax alloy core material which consists of an aluminum-Si system alloy, and is characterized by an area rate over all the Si grain of the Si grain of 5 micrometers or less in a brazing material being not less than 80%.

[Claim 2]A brazing sheet which comprises an aluminum alloy core characterized by comprising the following, and is characterized by an area rate over all the Si grain of the Si grain of 5 micrometers or less in a brazing material being not less than 80%.

Skin material for antioxidizing which consists of an aluminum alloy which has solidus temperature higher than liquidus temperature of a brazing material.

A brazing material which consists of an aluminum-Si system alloy.

Solidus temperature higher than liquidus temperature of a brazing material.

[Claim 3]A thin board of skin material for antioxidizing which consists of an aluminum alloy which has solidus temperature higher than liquidus temperature of a brazing material is sent in from an entering-board continuous casting machines side, A manufacturing method of a brazing-material sheet making brazing-material **** which consists of an aluminum-Si system alloy contact, performing cladding-ization of a thin board of skin material for antioxidizing, and a wax alloy core material with solidification of brazing-material ****, and making an area rate over all the Si grain of the Si grain of 5 micrometers or less in a brazing material not less than 80%.

[Claim 4]A manufacturing method of a brazing sheet making aluminum alloy core **** characterized by comprising the following contact, and performing cladding-ization of a brazing-material sheet and a core material with solidification of core material ****.

Skin material for antioxidizing which consists of an aluminum alloy which has solidus temperature higher than liquidus temperature of a brazing material.
Solidus temperature in which it comprises a brazing material which consists of an aluminum-Si system alloy, and an area rate over all the Si grain of the Si grain of 5 micrometers or less in a brazing material sends in a brazing-material sheet which is not less than 80% from the entering side to board continuous casting machines and in which a brazing material is higher than liquidus temperature.

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the brazing-material sheet, the brazing sheets, and those manufacturing methods for aluminum alloy joint FURAKKUSURESU soldering.
[0002]
[Description of the Prior Art]Generally soldering of the aluminum alloy which uses the alloy of an aluminum-Si system as a brazing material is performing oxide film removal by chloride system flux in atmospheric air. In order to prevent the corrosion of the product by the chloride which remained, the remains flux after soldering needs to remove. Since soldering products' having become soft by the thermal effect at the time of soldering and soldering are close to a final process, removal of remains flux is carefully performed so that a product may not be damaged. However, if there is flux which lost the glass-like flux and activity which took in the metal oxide superfluously, and was printed on the product face, full removal of flux will become difficult.
[0003]In recent years, since there is a pollution problem involved in the drainage accompanying a reduction demand of a flux solvent wiping removal process or flux use, the non-flux soldering method in the inside of a vacuum and the soldering method using the fluoride system flux in the inside of inert gas are developed, and reduction of the amount of the flux used is progressing.
[0004]Among these, although there is a big advantage that it is non-flux, in non-flux soldering in a vacuum, Unapplicable to junction of the material containing the components (for example, Mg, Zn, etc.) which evaporate easily in a vacuum, There is also a fault in the point of using vacuum atmospheres, like the soldering cost of equipment being expensive, the maintenance cost of a vacuum furnace being high, and an aluminum alloy with a low radiation rate being heated by radiation heat transfer.
[0005]The flux of the soldering method using the fluoride system flux in the inside of inert gas

is non-corrosion behavior.
Although it has the desirable feature that little amount of the flux used is, soldering atmosphere needs to be adjusted.
When soldering Mg content material, in order to generate the compound of a high-melting Mg-F system and to disappear a flux action, restrictions arise in soldering of Mg content material.
[0006]There is a method of attaching the coat which does not have a bad influence on soldering on the surface beforehand, and cannot oxidize easily as the inert gas of FURAKKUSURESU or a low-vacuum atmosphere soldering method from the idea which prevents oxidization on the surface of a brazing material. This coat (for example, nickel) is easily destroyed at the temperature at the time of soldering. However, the coat of metal other than an aluminum alloy has a problem from a viewpoint of recycling efficiency.
[0007]Then, there is the method of giving the coat of the skin material of the aluminum alloy whose solidus temperature is higher than the liquidus temperature of a brazing material beforehand to the brazing-material surface for the purpose of antioxidizing of a brazing material in a similar manner (JP,6-47578,A, JP,2001-47275,A). Since these comprise aluminum alloys, they are excellent in the recycling efficiency of aluminum itself. Since this brazing material is the structure which high-melting solid phase skin material controls the oxide film thickness increase at the time of core material wax liquefying, and solders by a deoxidization brazing-material alloy oozing out from skin material thin at the time of soldering, the flux for antioxidizing is fundamentally unnecessary. At the time of soldering, the oxide film formed in the aluminum alloy of skin material is formed on solid phase, and the thickness is very thin and does not have a big bad influence on soldering performance. When Mg is added by the brazing material, with Mg, reforming and reduction of the oxide film of skin material are carried out, and it is detoxicated. Such a brazing-material sheet [like] of structure attracts attention in order to enable soldering among the FURAKKUSURESU atmosphere especially in the field of lap joint soldering.
[0008]In an application-concerned Description, the brazing material which has a soldering function, and the solidus temperature which has an antioxidant function of a brazing material on this brazing-material surface the thing provided with the coat of the skin material of a high aluminum alloy from the liquidus temperature of a brazing material "A brazing-material sheet", The thing provided with the core material which has a structural material function is called a "brazing sheet."
[0009]However, also in the brazing-material sheet and brazing sheet which gave the coat of the skin material of the aluminum alloy whose solidus temperature is higher than the liquidus temperature of a brazing material to this brazing-material surface, It is a still severe processing condition cursing compared with a vacuum atmosphere among the high temperature atmosphere in which a brazing material oxidizes easily, or a low vacuum.

[0010]The difference in the melting points of skin material and an aluminum alloy brazing material is sometimes small as one of Reasons. For this reason, it is required that melting of the brazing material should be quickly carried out in the limited narrow temperature span. It is because oxidization of a brazing material advances, the mobility of a brazing material falls and poor soldering is caused, so that melting of a brazing material becomes long. Even if it thickens oxidization control skin material, a brazing material oozes, ** is delayed, in the stage where a brazing material oozes out, alloying, with high-melting skin material advances, the melting point of a brazing material goes up, the mobility of a brazing material falls, and poor soldering is caused. When the melting point of a soldering mating material is lower than the melting point of a skin material aluminum alloy, it is required that melting of the brazing material should be quickly carried out in the narrow temperature span which the thermal head which can be used in order to melt a brazing material became small, and was limited further.
[0011]If necessary, cladding rolling between heat can be considered to be a soldering function and a brazing-material oxidization control function as one of the means which manufactures the brazing sheet provided with the structural material function. In this case, all the materials that constitute each layer are joined by a solid phase state. The material which constitutes each layer is a plate material of the prescribed thickness which rolled the cut ingot or ingot of prescribed thickness. As for cladding rolling, it is common to be performed by hot-rolling which piled up and carried out [tacking] of both the materials, and was heated and controlled by 400-530 **. The aluminum slab hot-rolled has a thickness of 400-650 mm industrially, and big pressing down is added with hot-rolling. Since the hot-working nature of the material which constitutes each layer differs and big processing is added, at the end of the cross direction and the length direction, skin material is prolonged too much, and a cladding material flags, or can do the layer which the growth of skin material was conversely insufficient and lacked skin material. The cladding material longitudinal direction end and width direction end where the rate of cladding (ratio of the thickness of skin material to core material thickness) has not fallen within the predetermined range in hot-rolling to roll to several millimeters in thickness eventually are omitted.
[0012]In order to carry out cladding junction of skin material and the core material certainly and to obtain fixed the rate of cladding as possible, The physical relationship of skin material and a core material must be maintained strictly, time and effort -- union of initial material shape, the skin material at the time of heating, and a core material, a rolling path schedule, etc. need to be adjusted, and there is -- is taken, and productivity is low. The hot-rolled cladding material cold-rolls and is rolled to predetermined thickness. When an edge crack arises by the brazing material to which ductility fell with cold rolling repeatedly performed to predetermined thickness, trimming is carried out each time.
[0013]Since the brazing material used for cladding rolling between the heat which is the above

conventional brazing sheet manufacturing processes has a material as thick as hundreds of mm at the time of casting and its cooling rate is slow, 10-20-micrometer Si grain arises in a brazing material, and it becomes disadvantageous for quick melting of the wax at the time of soldering. The conventional brazing sheet manufacture accompanied by large pressing down In order to omit the portion besides the rate tolerance of cladding or to omit an edge crack portion, generally the yield is about 50% and is a low yield as compared with the usual aluminum alloy rolling material. As described above, since productivity is also low, the low thing of the yield also has conjointly the problem that a manufacturing cost is high.

[0014]

[Problem to be solved by the invention]This invention improves a brazing material in a forced cooling solidification organization using a continuous casting method, and raises soldering performance, and an object of this invention is to obtain a brazing-material sheet and a brazing sheet excellent in the yield and productivity by moreover carrying out cladding using a continuous casting method.

[0015]

[Means for solving problem]The inventor resulted in this invention wholeheartedly as a result of research, in order to solve the above-mentioned problem.

[0016]Namely, the skin material for antioxidizing which consists of an aluminum alloy which has the solidus temperature in which this invention is higher than the liquidus temperature of a brazing material of Claim 1, The brazing-material sheet which comprises a wax alloy core material which consists of an aluminum-Si system alloy, and is characterized by the area rate over all the Si grain of the Si grain of 5 micrometers or less in a brazing material being not less than 80%.

[0017]The skin material for antioxidizing which consists of an aluminum alloy which has solidus temperature higher than the liquidus temperature of a brazing material of Claim 2, The brazing sheet which comprises a brazing material which consists of an aluminum-Si system alloy, and an aluminum alloy core which has solidus temperature higher than the liquidus temperature of a brazing material, and is characterized by the area rate over all the Si grain of the Si grain of 5 micrometers or less in a brazing material being not less than 80%.

[0018]The thin board of the skin material for antioxidizing which consists of an aluminum alloy which has solidus temperature higher than the liquidus temperature of a brazing material of Claim 3 is sent in from an entering-board continuous casting machines side, A manufacturing method of the brazing-material sheet making brazing-material **** which consists of an aluminum-Si system alloy contact, performing cladding-ization of the thin board of the skin material for antioxidizing, and a wax alloy core material with the solidification of brazing-material ****, and making the area rate over all the Si grain of the Si grain of 5 micrometers or less in a brazing material not less than 80%.

[0019]The skin material for antioxidizing which consists of an aluminum alloy which has solidus temperature higher than the liquidus temperature of a brazing material of Claim 4, Comprise a brazing material which consists of an aluminum-Si system alloy, and the area rate over all the Si grain of the Si grain of 5 micrometers or less in a brazing material sends in the brazing-material sheet which is not less than 80% from the entering side to board continuous casting machines, It consists of a manufacturing method of the brazing sheet making aluminum alloy core **** which has solidus temperature higher than the liquidus temperature of a brazing material contact, and performing cladding-ization of a brazing-material sheet and a core material with the solidification of core material ****.

[0020]

[Invention embodiment] An aluminum-Si system alloy is used as a brazing material. It is desirable to use the aluminum-Si system alloy which contains 4.0 to 13.0% of Si, and specifically contains 0 to 1.6% of Mg. Since liquid phase temperature will rise rapidly exceeding eutectic point concentration if not less than 4.0% of Si is required in order to become enough and to secure a sex, and the amount of Si(s) exceeds 13.0% on the other hand, Since the fall of the mobility of the melting wax at the time of soldering heating will be caused and soldering nature will be reduced, the amount of Si(s) of the aluminum-Si system wax alloy of skin material was carried out 4.0 to 13.0% of within the limits. When soldering using flux, Mg addition to a wax alloy is not indispensable, but when performing FURAKKUSURESU soldering of vacuum soldering etc., in order to destroy an oxide film positively, it is preferred to add Mg into a wax alloy. In this case, when the amount of Mg exceeded 1.6%, the oxide film destructive effect did not improve any more, but since Mg evaporates and the inside of furnaces, such as a vacuum furnace, was made to only pollute, the amount of Mg in the case of adding Mg into a wax alloy was made into 1.6% or less. 0.01 to 0.3% of Bi and 0.01 to 0.3% of Li may be contained for assistance of work of above-mentioned Mg. Zn, Cu, and germanium which the melting point of a brazing material is reduced, and wax is damp as the result, and promote spread may be contained 0.01 to 2%.

[0021]And in this invention, in order to promote brazing-material melting at the time of soldering, the area rate over all the Si grain of the Si grain of the size below fixed in a brazing material was specified. It is thought that a melting facilitatory effect is based on the increase in the Si grain in a brazing material and the contact area of **** aluminum. When a brazing material reaches eutectic temperature, eutectic dissolution arises in the interface of Si grain and aluminum ****. A Si-grain miniaturization makes the originating point of eutectic dissolution increase, and is considered to give a melting facilitatory effect, and if there are many ratios of small Si grain, it will be easy to carry out melting of the wax. Then, in this invention, in order to promote brazing-material melting at the time of soldering, the area rate over all the Si grain of the Si grain of 5 micrometers or less in a brazing material is made into not less than 80%.

Although three dimensions should define essentially the size of the Si grain specified by the claim of this invention, since measurement and evaluation are difficult for it, the diameter at the time of converting the crystallized material in a two-dimensional observation plane into the circle of an identical area defines it. When grinding the section of a brazing material and observing with an optical microscope, it can ask for the value and the number of this diameter that carried out in terms of the yen easily by using an image analyzing device. If there is much larger Si grain than 5 micrometers, a melting facilitatory effect will not be acquired as compared with the conventional brazing material. Even if rarely big Si grain exists, there is no big influence in soldering nature, but if the area rate of larger Si grain than 5 micrometers exceeds 20%, influence will come out. Therefore, the area rate over all the Si grain of Si grain of 5 micrometers or less was made into not less than 80%. Since the diameter of Si grain influences soldering nature, the diameter of Si grain in the stage of the brazing-material sheet or brazing sheet used for soldering needs to have the above-mentioned value. The increase in a cooling rate at the time of casting solidification can attain the miniaturization of Si grain. Therefore, aluminum-Si **** is cast in the manufacturing process of this invention by the ****** method.

[0022]Although what is necessary is just to adjust suitably according to the situation to be used, if the thickness of a brazing material is less than 50 micrometers, it has the fall of the rolling yield by an edge crack etc., and the rise of the rolling cost by middle annealing, and is not preferred. Since the time which melting of skin material takes will become long and the melting time reduction effect by a Si-grain miniaturization will become thin if it exceeds 2000 micrometers, it is preferred that it is 50-2000 micrometers in the stage of the brazing-material sheet used for soldering. When there is too little capacity (thickness) of the brazing material itself, it alloys with skin material and a melting point goes up, and soldering under predetermined soldering conditions becomes impossible.

[0023]Since most needs to be a solid phase state at soldering temperature (generally [in aluminum-Si system brazing-material use] 590-610 **), the skin material which has an antioxidant function of a brazing material uses the aluminum alloy which has solidus temperature higher than the liquidus temperature of a brazing material. If even this condition is fulfilled, 1000 systems, 2000 systems, 3000 systems, 5000 systems, Although what kind of aluminum alloy may be sufficient as 6000 systems, 7000 systems, 8000 systems, etc., addition of an alloying element is unnecessary and the pure aluminum system alloy more than 99.5% (about [1050]) has the point that materials cost is cheap, and the point that solidus temperature is high to preferred aluminum purity. The skin material for antioxidizing whose most is a solid phase state at the time of soldering heating prevents spoiling the flow nature which oxide film thickness increase of the brazing material which liquefied is controlled, and a brazing material is covered with a thick oxide film, and will shine, and soldering nature. This

Reason is because the oxide film which also generates the same aluminum alloy on solid phase is generally far thinner than the oxide film generated on the liquid phase. As for the thickness of the skin material for antioxidizing, it is preferred that it is 0.1-300 micrometers in the stage of the brazing-material sheet used for soldering. If it is less than 0.1 micrometer, since [which is cursed from skin material] a thing oozes and ** is performed too much easily, oxide film increase of a brazing material cannot be controlled. If it exceeds 300 micrometers, a brazing material will ooze and ** will become difficult. When using it as a brazing-material sheet, the skin material for antioxidizing is laminated by both sides of a brazing material.

[0024]When giving the function as a structural material as a brazing-material sheet, it is considered as the brazing sheet which comprised three members of the skin material for antioxidizing, a brazing material, and the aluminum alloy core that has solidus temperature higher than the liquidus temperature of a brazing material. It is preferred that it is 0.1-300 micrometers in the stage of the brazing sheet which uses the thickness of the skin material for antioxidizing for soldering also in this case.

[0025]As for the thickness of a brazing material, it is preferred that it is 50-2000 micrometers in the stage of the brazing sheet used for soldering. If it is less than 50 micrometers, there are a fall of the rolling yield by an edge crack etc. and a rise of the rolling cost by middle annealing, and it is not desirable. If it is going to manufacture the brazing sheet that the thickness of a brazing material exceeds 2000 micrometers, the rigidity of skin material (brazing-material sheet) will become high at the time of casting, and the treatment at the time of casting will become difficult. When sending into ** roll caster type continuous casting machines, it stops meeting the curvature of a roll and stops for example, being able to carry out cladding casting well.

[0026]Like the skin material for antioxidizing, since the core material in the case of a brazing sheet needs to be a solid phase state at soldering temperature (590-610 **), the aluminum alloy which has solidus temperature higher than the liquidus temperature of a brazing material is used for it. If even this condition is fulfilled, 1000 systems, 2000 systems, 3000 systems, 5000 systems, Although what kind of aluminum alloy may be sufficient as 6000 systems, 7000 systems, 8000 systems, etc., since it can ask for the intensity as a structural member after soldering, the aluminum-Mn alloy of for example, 3000 systems, etc. are more preferred than a pure aluminum system alloy. When aluminum alloys, such as 2000 systems, 6000 systems, and 7000 systems, are used, improving strength can be expected by heat treatment after cooling and soldering after soldering heating. When using it as a brazing sheet, the brazing-material sheet (brazing-material-core material) which has skin material outside at least at least at one side of a core material is laminated, but even if both sides of a core material have a brazing-material sheet if needed, it does not matter even if it has skin material to both sides of a brazing-material sheet.

[0027]Below, a manufacturing process is explained. The thin board of the skin material for antioxidizing which consists of an aluminum alloy which has solidus temperature higher than the liquidus temperature of a brazing material in the manufacturing method of the brazing-material sheet of Claim 3 is sent in from an entering-board continuous casting machines side, The wax molten metal which consists of an aluminum-Si system alloy is made to contact, and lamination of the skin material thin board for antioxidizing and a wax alloy core material is performed with the solidification of a wax molten metal. [the manufacturing method of the brazing sheet of Claim 4] Send in the skin material of the brazing-material sheet which was carried out like Claim 3 and manufactured from the entering side to board continuous casting machines, aluminum alloy core **** which has solidus temperature higher than the liquidus temperature of a brazing material is made to contact, and lamination of a brazing-material sheet and a core material is performed with the solidification of core material ****.
[0028]As board continuous casting machines, although which types, such as a ** roll caster type, a belt caster type, and a block caster type, of body may be used, in order for the diameter of Si grain in a brazing material to be 5 micrometers or less, thin board casting is possible and the ** roll caster type use with a high cooling rate is preferred. In addition, rolling number-of-passes reduction of a post process and the manufacturing-cost reduction by the process of not annealing are expectable, so that thin board casting is performed.
[0029]As for the board thickness of the skin material for antioxidizing at the time of brazing-material sheet manufacture, 0.5-1.5 mm is preferred. If a skin material thin board is small compared with the thickness of a brazing material and it considers that the rate of cladding is about 10% when board thickness of a Reason is larger than 1.5 mm, Casting board thickness is as thick as 150 mm, and the cooling rate at the time of solidification falls, and it becomes impossible to make the area rate over all the Si grain of the Si grain of 5 micrometers or less in a brazing material not less than 80%. When smaller than 0.5 mm, manufacture of a healthy casting board becomes difficult by melting of the distorted and partial skin material of the board at the time of cladding casting.
[0030]As for the board thickness of the brazing-material sheet at the time of brazing sheet manufacture, 0.5-1.5 mm is preferred. If a Reason is cast in the ** rolling method with a roll diameter of 400-600 mm when board thickness is larger than 1.5 mm, since skin material does not meet the curvature of a roll firmly, insertion of the skin material at the time of casting cladding will become difficult. When smaller than 0.5 mm, manufacture of a healthy casting board becomes difficult by melting of the distorted and partial skin material of the board at the time of cladding casting. In the conventional method, by half-continuation (DC) casting, the brazing-material slab of 100 mm of thickness numbers is manufactured, surface cutting is carried out, and it hot-rolls. The Si grain in the brazing material of a brazing sheet will grow up into 10-20 micrometers in case of this method that the cooling rate at the time of ingot

production is slow, and by performing hot-rolling. In this invention, solidification of a **** core material performed simultaneously with junction to skin material is performed by cooling being carried out by direct contact with a water cooling roll, and the indirect contact through the solid phase skin material fed. In order to stabilize and send out skin material to a casting direction, it is desirable to give a guide and tension. It is always cooled by the roll, and even if the skin material fed contacts core material ****, in order not to carry out melting of it thoroughly, it is not fractured with the load of light tension. After casting sandwiches middle annealing if needed, and presses it down to target board thickness with cold rolling.

[0031]

[Working example]the work example 1 -- the work example about Claim 1 and the brazing-material sheet of 3 is described first. Half-continuous casting of the thing of a 1050 alloy-phase this component was carried out, and the thin board rolled in thickness of 1.1 mm was used as skin material for antioxidizing. As shown in drawing 1, using a ** roll caster machine 400 mm in diameter, in accordance with the roll, tension was given from the roll appearance side, and this thin board skin material (1) was supplied to the crevice (both sides) between a casting nozzle (6) and a roll (7). As core material **** (2), the thing (brazing-material composition) of the 4104 about component was used. Casting speed was 650 ** in molten metal temperature, and was considered as a part for 0.5-m/, and the casting condition set to 25 mm the setback (length to which skin material contacts ****). Thereby, it is 8 mm (inside, 1.0 mm each of skin material thickness rear surfaces.) in thickness. Skin material is melted by **** about 0.1 mm. The cladding material (8) of three layers was obtained. This cladding material (brazing-material sheet negative) (8) was cold-rolled to 0.2 mm in thickness, the brazing-material sheet was created, and it was considered as the example 1 of an invention. The perspective view showing skin material (1), the core material after solidification, and the physical relationship of a casting nozzle (6) is shown in drawing 3.

[0032]Cladding of the skin material (antioxidant material 10505 mm in thickness) is carried out to both sides of a brazing material (brazing-material 410430 mm in thickness) which manufactured with the usual half-continuous casting-rolling as the comparative example 1, respectively with hot-rolling, A three-layer brazing-material sheet with a thickness of 0.2 mm which cold-rolls after it and has the thickness of the same skin material as the example 1 of an invention and a brazing material was created. A three-layer brazing-material sheet with a thickness of 0.2 mm manufactured similarly to the comparative example 1 was created except small half-continuous casting with a cooling rate high as the comparative example 2 having cast a brazing material, and having stopped crystallization Si grain in size of 7-10 micrometers.

[0033]A size and the number of Si grain of each manufactured brazing-material sheet were measured with an image analyzing device ("LUZEX(registered trademark) FS" by Nireco

[Corp.] Corp.) attached to an optical microscope, and an area rate of the Si grain of 5 micrometers or less to all the Si grain was calculated. [of a brazing-material portion] Image analysis followed an optical microscope visual field which expanded the rolling direction section by 500 times.

[0034]Between the end faces of 3003 round bars [two] 10 mm in diameter, and 50 mm in length, on both sides of each manufactured brazing-material sheet, FURAKKUSURESU soldering in the atmosphere was carried out, and it compared, and joined on conditions for 600 **x 3 minutes. And joint strength of a joined round bar was evaluated. A result which did the tension test is shown in Table 1.

[0035]

[Table 1]

【表1】ろう材シートによる接合部の破断強度

	接合部破断強度 MPa	全Si粒子に対する5μm以下のSi粒子の面積率%	ろう材の液相線温度℃	皮材の固相線温度℃
発明例1	79	95	557	648
比較例1	30	50	557	648
比較例2	50	70	557	648

The examples 1 of an invention were 79MPa to the comparative examples 1 being [30MPa and the comparative example 2 of joined part breaking strength] 50MPa. It is shown that the example 1 of an invention is joined good also short-time soldering for 600 **x 3 minutes as compared with the comparative examples 1 and 2.

[0036]The work example of Claim 2 and the brazing sheet of 4 is described for ranking next work-example 2. The brazing-material sheet was created first. Half-continuous casting of the thing of a 1050 alloy-phase this component was carried out, and the thin board rolled in thickness of 1.1 mm was used as skin material for antioxidizing. Using a ** roll caster machine 400 mm in diameter, in accordance with the roll, tension was given from the roll appearance side, and this thin board skin material was supplied to the crevice between a **** nozzle and a roll (both sides). The thing of the 4104 about component was used as brazing-material ****. Casting speed was 650 ** in molten metal temperature, and was considered as a part for 0.5-m/, and the casting condition set to 25 mm the setback (length to which skin material contacts ****). Thereby, it is 8 mm (inside, 1.0 mm each of skin material thickness rear surfaces.) in thickness. Skin material is melted by **** about 0.1 mm. The cladding material of three layers was obtained. (It is the same as the example 1 of an invention so far). This was rolled to 1.1 mm in thickness, and the brazing-material sheet was created. Next this brazing-material sheet was used and cladding casting was performed further. As shown in drawing 2, using a ** roll caster machine 400 mm in diameter, in accordance with the roll, tension was given from the roll appearance side, and this brazing-material sheet skin material (1') was supplied to the crevice (both sides) between a **** nozzle (6) and a roll (7). As core material **** (2'), the thing (structural material composition) of the 3003 about component was used. Casting speed was

690 ** in molten metal temperature, and was considered as a part for 0.5-m/, and the casting condition set to 25 mm the setback (length to which skin material contacts ****, a water cooling roll, or ****). It is 8 mm (inside, 1.0 mm each of brazing-material sheet thickness rear surfaces.) in thickness by this. A brazing-material sheet is melted by **** about 0.1 mm. The cladding material (8') of seven layers was obtained. It cold-rolled to this cladding material (brazing sheet negative) (8), and the 2-mm-thick brazing sheet was obtained. This was made into the example 2 of an invention.

[0037]Cladding of the skin material (antioxidant material 10505 mm each in thickness) was carried out to both sides of the brazing material (brazing-material 410430 mm in thickness) which manufactured with the usual half-continuous casting-rolling as the comparative example 3, respectively with hot-rolling, and the brazing-material sheet to which was cold-rolled after it and 5.5 mm in thickness was made was prepared. Cladding of this brazing-material sheet was carried out to both sides of the core material of a 30-mm-thick 3003 about component with hot-rolling, it cold-rolled after that, and a seven-layer brazing sheet with a thickness of 2 mm which has the thickness of the skin material of the same outside as the example 2 of an invention and a brazing material was created. The seven-layer brazing-material sheet with a thickness of 2 mm manufactured similarly to the comparative example 3 was created except the small half-continuous casting as the comparative example 4 whose cooling rate is higher than the usual half-continuous casting having cast the brazing material, and having stopped inner Si grain in size of 7-10 micrometers.

[0038]The size and the number of Si grain of each manufactured brazing-material sheet were measured with the image analyzing device ("LUZEX(registered trademark) FS" by Nireco [Corp.] Corp.) attached to the optical microscope, and the area rate of the Si grain of 5 micrometers or less to all the Si grain was calculated. [of the brazing-material portion] Image analysis followed the optical microscope visual field which expanded the rolling direction section by 500 times.

[0039]Between the end faces of 3003 round bars [two] 10 mm in diameter, and 50 mm in length, on both sides of each manufactured brazing sheet, FURAKKUSURESU soldering in the atmosphere was carried out, and it compared, and joined on the conditions for 600 **x 3 minutes. And the joint strength evaluation test of the joined round bar was done. The result of having done the tension test of the test piece is shown in Table 2.

[0040]

[Table 2]

【表２】ブレージングシートによる接合部の破断強度

	接合部破断強度 MPa	全Ｓｉ粒子に対する５μｍ以下のＳｉ粒子の面積率%	ろう材の液相線温度℃	皮材の固相線温度℃	芯材の固相線温度℃
発明例２	７７	９３	５５７	６４８	６４３
比較例３	３３	５２	５５７	６４８	６４３
比較例４	４９	７２	５５７	６４８	６４３

[0041]The examples 2 of an invention were 77MPa to the comparative examples 3 being [33MPa and the comparative example 4 of joined part breaking strength] 49MPa. It is shown that the example 2 of an invention is joined good also short-time soldering for 600 **x 3 minutes as compared with the comparative examples 3 and 4.

[0042]

[Effect]As explained in full detail above, [the brazing-material sheet brazing sheet of this invention] Since Si grain was made fine so that the area rate over all the Si grain of the Si grain of 5 micrometers or less in a brazing material might be not less than 80%, and also the brazing-material surface was covered with the skin material which has an oxidization control function, Since oxidization of a brazing material is controlled and quick melting of a brazing material is performed even if it curses in the atmosphere or low-vacuum atmosphere and does not use flux in heating, good soldering can be attained. Since board continuous casting machines are used for manufacture, compared with the conventional method of obtaining each member from a half-continuous ingot, and laminating by a solid phase state, it does not come out of the crystallization Si grain in a brazing material as much as possible finely, productivity and a product yield can be improved, and a manufacturing cost can be made cheap.

[Brief Description of the Drawings]

[Drawing 1]It is a schematic illustration at the time of brazing-material sheet manufacture.

[Drawing 2]It is a schematic illustration at the time of brazing sheet manufacture.

[Drawing 3]It is a perspective view of the nozzle part neighborhood.

[Explanations of letters or numerals]

1: Skin material (1050)

1': Skin material (brazing-material sheet)

2: Core material **** (4104)

2': Core material **** (3003)

3: Cast gutter

4: SUPAUTO

5: Tan Daish

6: Casting nozzle

7: Water cooling roll

8: Cladding material (brazing-material sheet negative)

8': Cladding material (brazing sheet negative)

[Drawing 1]

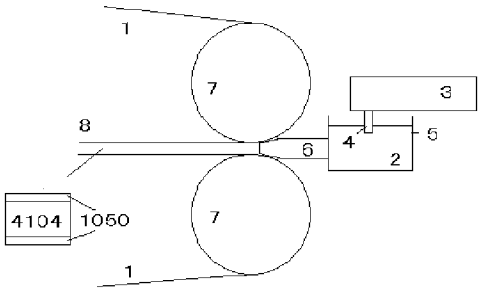

図1 ろう材シート製造時略図

[Drawing 2]

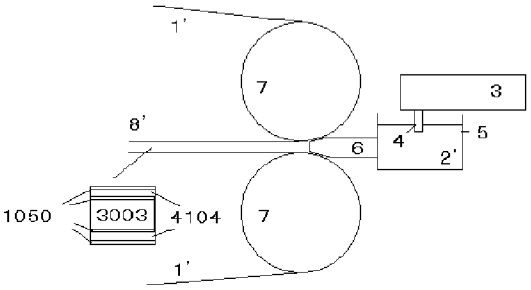

図2 ブレージングシート製造時略図

[Drawing 3]

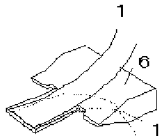

図3 ノズル部 斜視図

[Translation done.]